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# **DIESEL ENGINE FRESH WATER COOLING SYSTEM**

**Description and Maintenance Instructions**

**H641-A76-241**

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## I. DESCRIPTION

### A. PURPOSE AND BASIC SPECIFICATIONS

The diesel engine fresh water cooling system pipe line is designed:

1. To cool down the diesel engines during operation and after stoppage.
2. To fill the system with fresh water from the ship's fresh water system.

The pipe line of the system is made of copper pipes having the following diameters and wall thickness: 105x2.5, 85x5, 75x2.5, 45x2.5, 32x2, 24x2, 14x1.5, 9x1.5, 6x1.5.

The pipe running from the ship's fresh water system to valve 33 is made of steel and its diameter is 32x2.5.

The pipes are interconnected as follows:

- (a) pipes up to dia. 32 mm - by unions;
- (b) pipes over 32 mm - by flanges.

The pipe line joints and fittings are made of brass.

The joints are provided with paronite gaskets.

The system consists of the following pipe lines:

- (a) expansion tank filling line;
- (b) system filling line;
- (c) line, cooling the diesel engines during operation;
- (d) line, cooling the diesel engines after stoppage;
- (e) steam escape line;
- (f) expansion tank vent line;
- (g) system pressurization line;
- (h) system drain line.

The fresh water cooling system pipe line assembly has been subjected to hydraulic pressure test under a pressure of:

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- (1) The expansion tank vent line is tested by water filling.
- (2) The expansion tank vent line is tested by water filling.
- (3) The expansion tank vent line is tested by water filling.
- (4) The expansion tank vent line is tested by water filling.
- (5) The expansion tank vent line is tested by water filling.
- (6) The expansion tank vent line is tested by water filling.
- (7) The expansion tank vent line is tested by water filling.
- (8) The expansion tank vent line is tested by water filling.
- (9) The expansion tank vent line is tested by water filling.
- (10) The expansion tank vent line is tested by water filling.

#### Specifications of Pump BUH-65y

1. Output - 38 m<sup>3</sup>/hr.
2. Speed - 3000 r.p.m.
3. Pressure head (delivery + suction) - 18 m of water column.
4. Suction head - 5 m of water column.
5. Shaft power - 4.0 kW.

#### **B. GENERAL DESCRIPTION AND DESCRIPTION OF INDIVIDUAL UNITS**

The fresh water cooling system of a diesel engine consists of:

- (1) expansion tank with three compartments;
- (2) three water-to-water heat exchangers, type BXH-10H;
- (3) three water temperature regulators PTM-80;
- (4) one centrifugal pump, type BUH-65y;
- (5) one fresh water auxiliary heat exchanger, type OMB-1.2;
- (6) one hand-operated piston pump;
- (7) water level gauge;
- (8) measuring instruments;
- (9) expansion tank water level warning system;
- (10) pipes and fittings.

Fresh water with a total content of chlorides and sulfates not exceeding 300 mg/lit and water hardness not over 2.15 mg/equiv.lit is used for cooling the diesel engines.

To minimize corrosion of diesel engine parts, emulsion additive is added into the cooling water (see Diesel Engine 2H42. Service Manual).

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The expansion pipe line and the expansion tank are connected to the ship's fresh water system through a three-way cock 32, hand-operated pump 30. The pump is mounted on the partition of the portside frame and is a double-acting pump, type I, with an output of 48 m<sup>3</sup> per minute, a head of 30 m of water column and 48 strokes per minute.

Heating of each diesel engine during its operation is performed along a closed circuit, i.e. circulation pump mounted on the engine - cooling chambers - heat exchangers-pump.

The circulation pump mounted on the engine delivers water into the cooling chambers: cylinder block and gas exhaust manifold jacket. From the outflow pipe of gas exhaust manifold the hot water passes through pipe "c" provided with a temperature regulator transmitting element and then comes into the temperature regulator PTM-80 designed to maintain the temperature of cooling water, running out of the engine, within 75 to 85°C. Depending on the temperature of the water, passing out of the engine, regulator PTM-80 directs the water either through the fresh water heat exchanger BXH-101 or past the heat exchanger directly to non-return valve 3, 1 or 42 fitted on the pipe line, before the intake manifold of the circulation pump mounted on the engine.

To compensate for changes of the volume of water circulating in the closed cooling system, caused by heating, leakage or evaporation, the pipe line is equipped with expansion tank divided into three compartments.

Each compartment of the tank is connected with the pipe line of its engine through pipes "b" and "f" and corresponding shut-off cocks.

Ventilation and bleeding of steam out of the engine cooling system pipe line is performed through pipes "f" and cocks 29, 26, 22 in the expansion tank.

Compensation for leakage or evaporation of fresh water out of the system of each diesel engine is carried out from the expansion tank through pipes "b" and cocks 28, 27 and 25.

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The water level in the expansion tank is observed with the aid of water level gauge 20 installed beside the tank; besides, there is a water level warning system located on the control station of the diesel engine.

The warning system transmitting elements are connected to the expansion tank compartments with the aid of pipes equipped with cocks 16, 15, 14.

The expansion tank compartments are ventilated through pipes "g" brought out into the hold. The pipes are not equipped with shut-off cocks. They are connected to the diesel engines and to pump BMH-65y with the aid of syphon compensators and durite oil resistant couplings (steam escape pipe line).

To cool the diesels after their stoppage a provision is made for an auxiliary circulation system consisting of autonomous pump BMH-65y, fresh water auxiliary heat exchanger OMB-1.2, two three-valve boxes 5 and 44 and corresponding pipes (intake section "d" and delivery section - "e").

To cool the engine after its stoppage, open the respective valves of the three-valve boxes 5 and 44.

From the diesel engine the hot water passes through auxiliary heat exchanger OMB-1.2 where the heat is transferred to the sea water, then runs into the intake chamber of pump BMH-65y and back into the engine.

The sea water is forced into the heat exchanger autonomous pump BMH-90a of the heat exchangers and gas exhaust sea water cooling system (see Sea Water Cooling System Pipe Line of Diesel Engine Gas Exhausts, Diesel-Compressor Sets Heat Exchangers and Shaft Lines. Description and Maintenance Instructions).

The fresh water circulation is going on until its temperature drops to about 40°C.

The system ensures only consecutive cooling of diesel engines.

The system is drained for repairs or during prolonged stoppages with the aid of the engine starting pipe line through a hose used for pneumatic operations and one end of which is connected to the air pipe line and the other - to the union - blank plug 34.

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The system is blown through overboard, cocks and double-ended boxes open, through valves 53 and 54 connected with the sea water cooling system of the diesel-compressor sets ДК-2 (see Sea Water Cooling System Pipe Line of Diesel Engine Gas Exhausts, Heat Exchangers, Diesel-Compressor Sets and Shaft Lines. Description and Maintenance Instructions).

The system is pressure-tested with fresh water with the aid of hand-operated pump 30. For this purpose the pressure is developed by priming water with the aid of pump 30 into the system through pipes "1".

(a) Expansion Tank

(Appendix 2)

The expansion tank is mounted within frames 86-88 on the starboard deck-head.

The tank body is made of 3 mm zinc-plated steel.

The tank consists of three isolated compartments. Each compartment of about 80-lit capacity is meant for one diesel engine.

For cleaning, the tank is provided with necks 70.

The tank is equipped with branch pipes designed:

- (a) for filling the cooling system;
- (b) for filling the tank;
- (c) for ventilation of the cooling system;
- (d) for ventilation of the tank into the bilge;
- (e) for water level gauge.

The tank assembly is tested for proper sealing by being filled with water.

(b) Fresh Water Heat Exchangers БХД-10М

(Appendix 3)

The water-to-water heat exchangers are designed to cool down the fresh water by the sea water.

The heat exchangers are located in the bilge within frames 81-83.

The heat exchangers are made of flat pipes. The fresh water is fed into the pipes, while the sea water passes outside (see Fresh Water Heat Exchangers БХД-10М. Description and Maintenance Instructions).

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(c) Direct Action Temperature Regulator  
(Thermostat) PTHAM-80

Type PTHAM-80 direct action temperature regulator is designed for automatic control of cooling water temperature.

For reference, see Direct Action Temperature Regulator, Type PTHAM-80. Description and Instructions on Mounting and Operation.

(d) Fresh Water Auxiliary Heat Exchanger

(Appendix 4)

The fresh water auxiliary heat exchanger OMB-1.2, designed to cool down the fresh water in the systems of diesel engines after their stoppage, is located in the bilge in the vicinity of frames 81-82.

Heat exchanger OMB-1.2 is round-pipe unit meant for full sea water pressure inside the pipes and for a pressure of 4 kgf/cm<sup>2</sup> in the inter-pipe space through which the fresh water passes. Tubular boards 88 made of tin brass accommodate 152 pipes of 10x1 mm made of nickel alloy.

Protectors 90 are positioned on the tubular boards. Housing covers 89, to which the sea water pipe line is connected, is made of tin bronze. The fresh water washes the pipes across the sea water stream running inside them, thus making for a better heat exchange process. Both chambers of the heat exchangers are drained out through special plugs 91 and 92.

(e) Water Level Gauge

(Appendix 5)

The water level gauge has three measuring glasses and is designed to check the level of water in all the three compartments of the expansion tank. Lower housing 93 and upper housing 94 of the gauge have two threaded sockets for fastening each. Floats made of plexiglass are fitted into the measuring glasses to improve the checking of level.

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## C. MEASURING INSTRUMENTS AND WARNING SYSTEM

Nos on the dia-gram	Purpose, name and type of instrument	Type of in-dicator and scale	Normal operat-ing value / Maximum operating value	Location of in-dicator	Notes
1	2	3	4	5	6
46,50,51	Pressure in fresh water pumps deli-very line. Pressure gauge	MTK100Bx10 precision class 2,5	<u>3.5 to 4.0 kgf/cm<sup>2</sup></u> 4.0 kgf/cm <sup>2</sup>	On instrument panels of diesel engines in the vicinity of cont-rol station re-cess on partition at frame 83	
47	Pressure in deli-very line of pump BHH-65y. Pressure gauge	MTK100Bx10 precision class 2,5	<u>1.5 to 1.8 kgf/cm<sup>2</sup></u> 2 kgf/cm <sup>2</sup>	On instrument panel of pump BHH-65y in the control station recess	
48	Rarefaction in intake line of pump BHH-65y. Vacuum pressure gauge	MTK100B-760-0-25	<u>270 to 300 mm Hg</u> 380 mm Hg	On instrument panel of pump BHH-65y in the control station recess	

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1	2	3	4	5	6
45,49,52	Water temperature at outlet of diesel engines. Thermo-electric set	TAK-022 0-125°C	<u>75 to 85°C</u> 88°C	The indicator is located in the vi- cinity of the cont- rol station on the starboard	

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Expansion Tank Water Level Warning  
System

The warning system is designed to produce a light signal, when the water in the tank compartments drops to the least permissible level. For this purpose diaphragm type transmitting elements, shut off by cocks 16, 15, 14 are installed in the filling pipes of the system. When the water level in the tank compartments is over  $200 \pm 50$  mm, the transmitting element diaphragm is compressed, but when the level of water in the tank drops to  $200 \pm 50$  mm and lower, the diaphragm is released and closes the circuit of signal lamp on the signal board available on the diesel remote control station.

The diesel engine water outlet line is provided with a transmitting element of thermal relay TPK-3, signalling overheating of water.

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## II. MAINTENANCE INSTRUCTIONS

### A. GENERAL CARE AND MAINTENANCE

To ensure readiness of the fresh water cooling system pipe line of the diesel engines for operation, do the following:

1. Check the flange and union joints for proper sealing. In case of leakage, tighten up the joints or replace the gaskets.
2. Regularly check the water level in expansion tanks. If the water in the tank drops to 200 mm, refill it.

### B. PREPARING THE PIPE LINE FOR OPERATION

#### (a) Initial Position

1. The entire pipe line is filled with water, the expansion tank is filled with water to 3/4 of its capacity.
2. Three-way cock 32 is set to such a position at which pipe "a" through valve 33 is connected with atmosphere (see Fig.1).

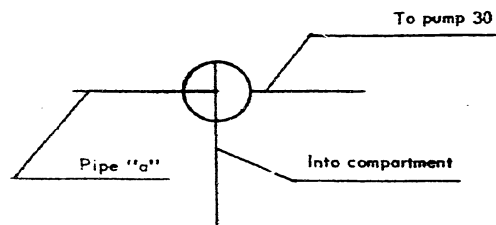


FIG. 1

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3. Valve 33, all valves of three-valve boxes 5, 44 and valves 53, 54 are closed.
4. Cocks 31, 24, 23, 21, 6, 4, 2, 43, 41, 40 are closed.
5. Cocks 29, 28, 27, 26, 25, 22, 16, 15, 14, 10, 9, 8, 11, 7, 37, 36, 39, 38 are open, handles removed and secured on the pipes near the cocks, oil seals tightened up.
6. Cocks 17, 18 and 19 of water level gauges are set to position shown in Fig.2.

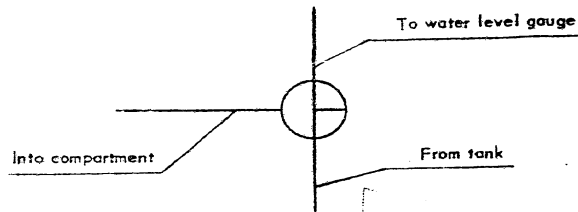


FIG. 2

(b) Filling the Pipe Line with Water

When there is no fresh water in the system (after mounting, repairs or a prolonged standstill in winter time) or when it is necessary to fill the entire system or one diesel engine with fresh water proceed as follows:

1. Open the vent plugs and cocks in the fresh water chambers of diesels and heat exchangers (for partial refilling, open only the top vent holes).
2. Open:
  - cock 24 to fill the portside diesel system;
  - cock 23 to fill the centre diesel system;
  - cock 21 to fill the starboard diesel system.
3. Set cock 32 to such a position at which pipe "a" is connected with the pump (see Fig.3).
4. Open valve 33.
5. Use hand-operated pump 30 to pump the water into the system.
6. As soon as water free of air bubbles appears in the vent holes, close the holes.

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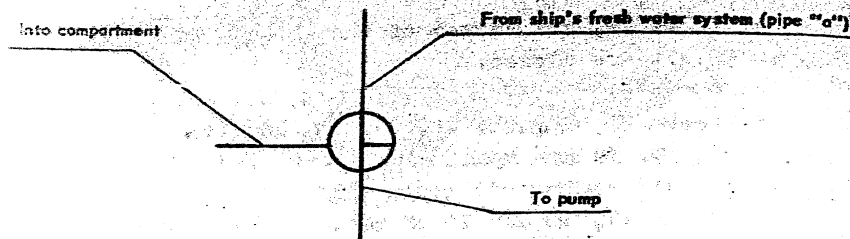


FIG. 3

7. Fill the expansion tank to 3/4 of its capacity as indicated by the water level gauge. If no drop of water inside the tank is detected, it is indicative of the fact that the entire system is filled with water.

8. After the cooling pipe line has been filled, bring the system to the initial position.

(c) Introduction of Additive into Pipe Line

Prior to introducing emulsion additive, fill the diesel system with fresh water up to 40 - 60% of its capacity.

The required quantity of additive is equal to 1% of the weight of water in the cooling system.

Take 1.5 - 2 kg of additive, thoroughly mix it up in 5 - 8 lit of fresh water warmed up to 40 - 60°C in a portable vessel: after mixing fill the water into the system through funnel with cock 31, for which purpose proceed as follows:

9. Make sure that cock 32 is in its initial position.

10. Open cock 31.

11. Use the hand-operated pump to pump the additive solution into the system.

12. After the additive has been pumped in, fill the system to capacity, start the diesel engine and run it for 10 min for better mixing of the additive.

Note. Check the content of additive in the cooling water as instructed in the Diesel Engine 2042 Service Manual.

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**3. STARTING, MAINTENANCE DURING OPERATION,  
AND STOPPAGE**

Before starting the diesel engines:

1. Check the availability of water in the expansion tank. The level in the tank should be at least 3/4 of its capacity.
2. See that valves 33, 53, 54, cocks 31, 24, 23, 21, 6, 4, 2, 43, 41, 40 and three-valve boxes 5 and 44 are closed.
3. Make sure that three-way cock 32 is in its initial position.

**During Operation and After Stoppage  
of Diesel Engines**

1. Watch the expansion tank water level warning system and periodically inspect the water level in each compartment of the expansion tank visually.

When the water level in the tank drops to 200 mm, refill it.

2. Observe readings of the instruments; the values of temperature and pressure in the system must be within the limits indicated in the diesel engine service manual.

3. Check indications of water gauges for which purpose drain the water out of them with the aid of cocks 17, 18, 19 and then reconnect the glasses with the tank.

Before stopping a diesel (diesels) the fresh water cooling system pipe line of the diesels does not require any additional operations to be performed.

After a diesel (diesels) has been stopped, cool it down, if necessary (e.g. rise of air temperature in the premises) by priming fresh water through its system via auxiliary heat exchanger OHB-1.2. To do so, proceed as instructed below.

**To pump water through portside diesel engine 2Д42:**

1. Open the corresponding valve of three-valve box 44.
2. Open the corresponding valve of three-valve box 5.
3. Start the БУМ-65y pump.

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To pump the water through starboard diesel engine 2H42:

1. Open the corresponding valve of three-valve box 44.
2. Open the corresponding valve of three-valve box 5.
3. Start the B4H-65y pump.

To pump water through centre diesel engine 2H42:

1. Open the corresponding valve of three-valve box 44.
2. Open the corresponding valve of three-valve box 5.
3. Start the B4H-65y pump.

Note. Sea water is delivered to auxiliary heat exchanger OMB-1.2 in compliance with Description and Maintenance Instructions on Sea Water Cooling System Pipe Line of Diesel Gas Exhaust, Heat Exchangers, Diesel-Compressor Sets and Shaft Lines.

**CAUTION!** Never pump water through two or three diesel engines simultaneously.

**D. MAINTENANCE DURING PROLONGED STANDSTILL PERIODS**(a) Draining the Pipe Line

In case of repairs or during prolonged periods of standstill, drain the pipe line of each diesel engine.

Draining the Starboard Diesel Engine Pipe Line

1. Close cocks 25, 22 and make sure that cock 21 is closed.
2. Open cocks 6, 4.
3. Open the corresponding valves of three-valve box 5 and three-valve box 44.
4. Connect one end of the hose for pneumatic operations to the cross-piece designed to deliver air for blowing over the mechanisms (see Description and Maintenance Instructions for Starting Pipe Line of Diesels, Diesel-Compressor Sets and Pipe Line of Pneumatic Clutches Control).
- Connect the opposite end of the hose to blank plug 34.
5. Open valves 53, 54.
6. Open the drain kingston valve on the sea water pipe line (see Description and Maintenance Instructions for Sea Water Cooling System Pipe Line of Diesel Gas Exhaust, Heat Exchangers, Diesel-Compressor Sets and Shaft Lines).

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7. Open the butterfly throttle valve on the starting air pipe line (see Description and Maintenance Instructions for Starting Pipe Line of Diesels, Diesel-Compressor Sets AK-2 and Pipe Line of Pneumatic Clutches Control).

8. Blast the system through with air under a pressure of 2 - 3 kgf/cm<sup>2</sup>.

Note. Absence of water in the system is determined with the aid of opening of the plug available on the heat exchanger OMB-1.2.

9. After the system has been drained, close valves 53, 54 while the pipe line is still under pressure.

10. Close the butterfly throttle valve on the starting air system (see Description and Maintenance Instructions for Starting Pipe Line of Diesels, Diesel-Compressor Sets AK-2 and Pipe Line of Pneumatic Clutches Control).

11. Relieve the system from pressure.

#### Draining the Starboard Diesel Engine Tank

12. Open cocks 25, 22, 21.

13. Drain water out of the tank into the pipe line.

14. Close cocks 25, 22, 21.

15. Open valves 53, 54.

16. Open the butterfly throttle valve on the starting air pipe line.

17. Blast the system through with air under a pressure of 2 - 3 kgf/cm<sup>2</sup>.

Note. Absence of water in the system is determined with the aid of opening of the plug available on the heat exchanger OMB-1.2.

18. After the system has been drained, close valves 53, 54, while the pipe line is still under pressure.

19. Close the butterfly throttle valve on the sea water pipe line (see Description and Maintenance Instructions for Sea Water Cooling System Pipe Line of Diesel Gas Exhausts, Heat Exchangers, Diesel-Compressor Sets and Shaft Lines).

20. Relieve the system from pressure and bring the system to initial position.

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Draining the Centre Diesel Engine Pipe Line

21. Close cocks 27, 26 and make sure that cock 23 is closed.
22. Open cocks 2, 41.
23. Open the corresponding valves of three-valve box 5 and three-valve box 44.
24. Carry out operations indicated in Items 4, 5, 6, 7, 8, 9, 10 and 11.

Draining the Centre Diesel Engine Tank

25. Open cocks 27, 26, 23.
26. Drain the water out of the tank into the pipe line.
27. Close cocks 27, 26, 23.
28. Do as instructed in Items 15, 16, 17, 18, 19, 20.

Draining the Portside Diesel Engine Pipe Line

29. Close cocks 29, 28 and make sure that cock 24 is closed.
30. Open cocks 43, 40.
31. Close the corresponding valves of three-valve box 44 and three-valve box 5.
32. Carry out operations listed in Items 4, 5, 6, 7, 8, 9, 10 and 11.

Draining the Portside Diesel Engine Tank

33. Open cocks 29, 28, 24.
34. Drain the water out of the tank into the pipe line.
35. Close cocks 29, 28, 24.
36. Do as instructed in Items 15, 16, 17, 18, 19, 20.

(b) Disassembly and Assembly

1. During disassembly and assembly of the pipe lines take care to see that no foreign objects get into them, for which purpose protect the ends of disconnected pipe lines with wooden or metal blind plugs. It is prohibited to blind off the pipes with cotton waste or oakum to avoid their penetration into the pipe line.

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2. Use only standard tools to avoid damage of parts during the disassembly and assembly of pipe lines.

3. Types, sizes and material of new pipes and fittings installed during repairs should comply with the specifications.

4. Check the pipe lines or their separate sections after each repair of the system for adequate tightness.

5. In case of glass replacement on the water level gauge 20 (see Appendix 5), remove corresponding cover 100, detach plates 97, release oil seal nut 99, take out the gland packing, screw out union 95 and remove the glass. Install a new glass in the reversible order.

#### E. TROUBLES, DAMAGES AND REMEDIES

Nos	Trouble	Cause	Remedy
1	Leakage of water through valves and cocks	Ununiform wear or damage of mating surfaces of valve discs, seats or plugs	Lap up the valve discs or cock plugs
2	Drop of water level in the system	Leakage through flanges or union joints. Leakage through durite joints	Tighten up the joints or replace the gaskets. Tighten up the clamping collars or replace the durite hoses

#### F. SCHEDULED INSPECTIONS AND REPAIRS

##### I. Daily Inspection

1. Inspect and clean the pipe lines, fittings and measuring instruments. Check level of water in expansion tanks.

##### II. Weekly Inspection

Carry out all operations prescribed for daily inspection and proceed as follows:

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2. Manipulate all valves and cocks until they are easy to turn. Make sure that the line is properly connected and the valves assume the right positions.

3. Inspect and check hand-operated pump 30 for proper operation.

### III. Monthly Inspection

Carry out all operations pertaining to weekly inspection and besides:

4. Check the oil seals of valve rods and cock plugs for serviceability and tighten them up, if necessary.

5. Open the valve box of hand-operated pump 30, inspect the valves and springs, and remove the faults, if revealed.

### IV. Inspection after Every 3 Months

Perform all operations prescribed for monthly inspection and proceed as follows:

6. Inspect water-level gauges of expansion tanks, open and clean them, if necessary.

### V. Inspection at Running Repairs of Ship

Carry out all operations pertaining to inspections performed after every three months and besides do the following:

7. If necessary, reassemble and repair the valves, cocks and hand-operated pump.

8. Reassemble and clean the water level gauge glasses, test the water pipe line assembly for tightness.

9. At docking test the section of systems communicating with the overboard space for operating pressure.

### Pressure Test

After the completely drained system has been refilled, test it for proper tightness under a pressure of  $4.0 \text{ kgf/cm}^2$ .

Test closed-circuit circulation pipe lines of each diesel engine separately.

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Pressure Test of Starboard Diesel Engine  
Pipe Line

1. Make sure that the system is in its initial position.
2. Set cock 32 to position indicated in Fig.4.

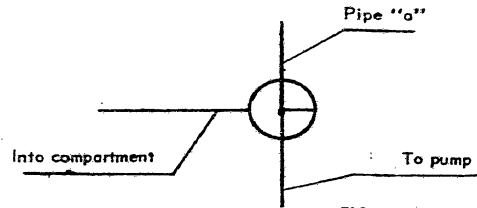


FIG. 4

3. Close cocks 25, 22, 21.
4. Open cock 6, corresponding valves of three-valve box 44 and three-valve box 5.
5. Open valves 33 and use hand-operated pump 30 to force the water into the system until a pressure of  $4.0 \text{ kgf/cm}^2$  is obtained.
6. Keeping the system under pressure inspect all joints and make sure that there are no damages or improper sealing. Remove the faults, if any, and repeat the pressure test.

Pressure Test of Portside Diesel  
Engine Closed-Circuit Pipe Line

7. Make sure that the system is in its initial position.
8. Set cock 32 to position shown in Fig.4.
9. Close cocks 29, 28, 24.
10. Open cock 40, corresponding valves of three-valve box 44 and three-valve box 5.
11. Open valve 33 and use hand-operated pump 30 to force the water into the system until a pressure of  $4.0 \text{ kgf/cm}^2$  is obtained.
12. Keeping the system under pressure, inspect all joints and make sure that there are no damages or improper sealing. Remove the faults, if any, and repeat the pressure test.

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Procedure Test of Centre Diesel  
Engine Closed-Circuit Pipe Line

16. Make sure that the system is in its initial position.
17. Set cock 32 to position indicated in Fig.4.
18. Close cocks 27, 26, 23.
19. Open cock 41, corresponding valves of three-valve box 44 and three-valve box 5.
20. Open valve 33 and use hand-operated pump 30 to force the water into the system until a pressure of  $4.0 \text{ kgf/cm}^2$  is obtained.
21. Keeping the system under pressure, inspect all joints and make sure that there are no damages or improper sealing. Remove the faults, if any, and repeat the pressure test.

Note. The cooling pipe line of diesel engines is to be tested after their stoppage, following the test of three-valve boxes 5 and 44 and once together with the pipe line of any of the diesels.

**G. REFERENCE DATA**

1. Capacity of expansion tank of each diesel is about 80 lit.
2. Sizes of pipes (outer diameter and thickness of walls): 105x2.5, 85x2, 75x2.5, 45x2.5, 32x2, 24x2, 14x1.5, 9x1.5, 6x1.5.  
Material: copper.  
Pipe 32x2.5 running from the ship's fresh water system to valve 33 is made of steel.
3. Line joining elements and fittings are made of brass.
4. The gaskets are made of paronite.
5. Service life of durite hoses is five years.
6. Pump BUH-65y.  
Output -  $38 \text{ m}^3/\text{hr.}$   
Speed - 3000 r.p.m.  
Pressure head (delivery + suction) - 18 m of water column.  
Suction head - 5 m of water column.  
Shaft power - 4.0 kW.
7. Hand-operated pump, type I.

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Output at 48 double strokes per min - 12 lit/min.

Water head - 30 m of water column.

8. Total amount of fresh water in the cooling system - about 900 lit.

For more detailed study of the system it is recommended to use the following:

1. Diesel Engine 2И42. Service Manual.
2. Description and Maintenance Instructions for Sea Water Cooling System Pipe Line of Diesel Gas Exhausts, Heat Exchangers, Diesel-Compressor Sets and Shaft Lines.
3. Description and Maintenance Instructions for Fresh Water Heat Exchangers BXД-10И.
4. Description and Instructions for Mounting and Operation of Direct Action Temperature Regulator, PTHДМ-80.
5. Instructions on Mounting and Operation of Thermal Relay ТРК-3.

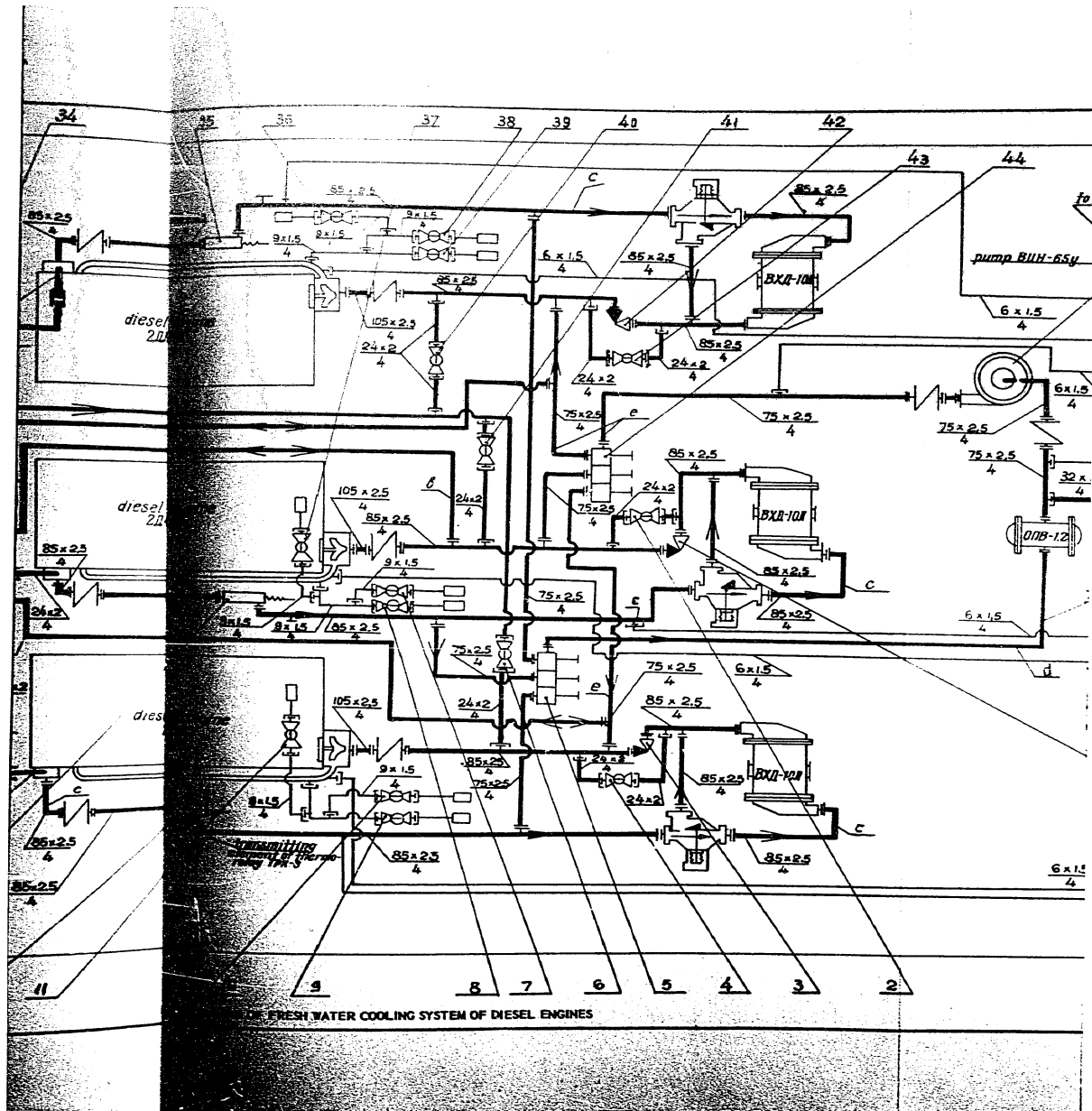
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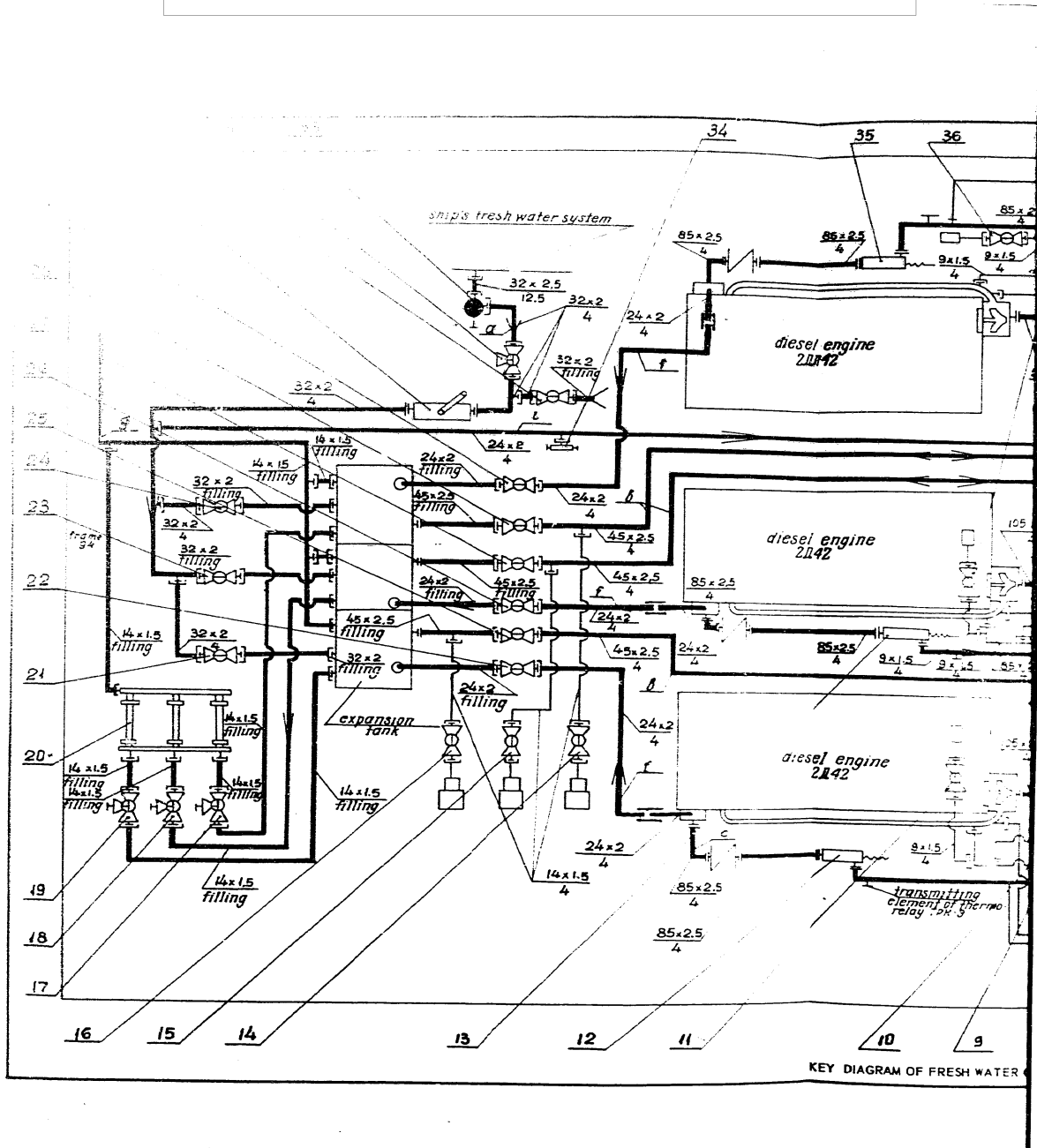


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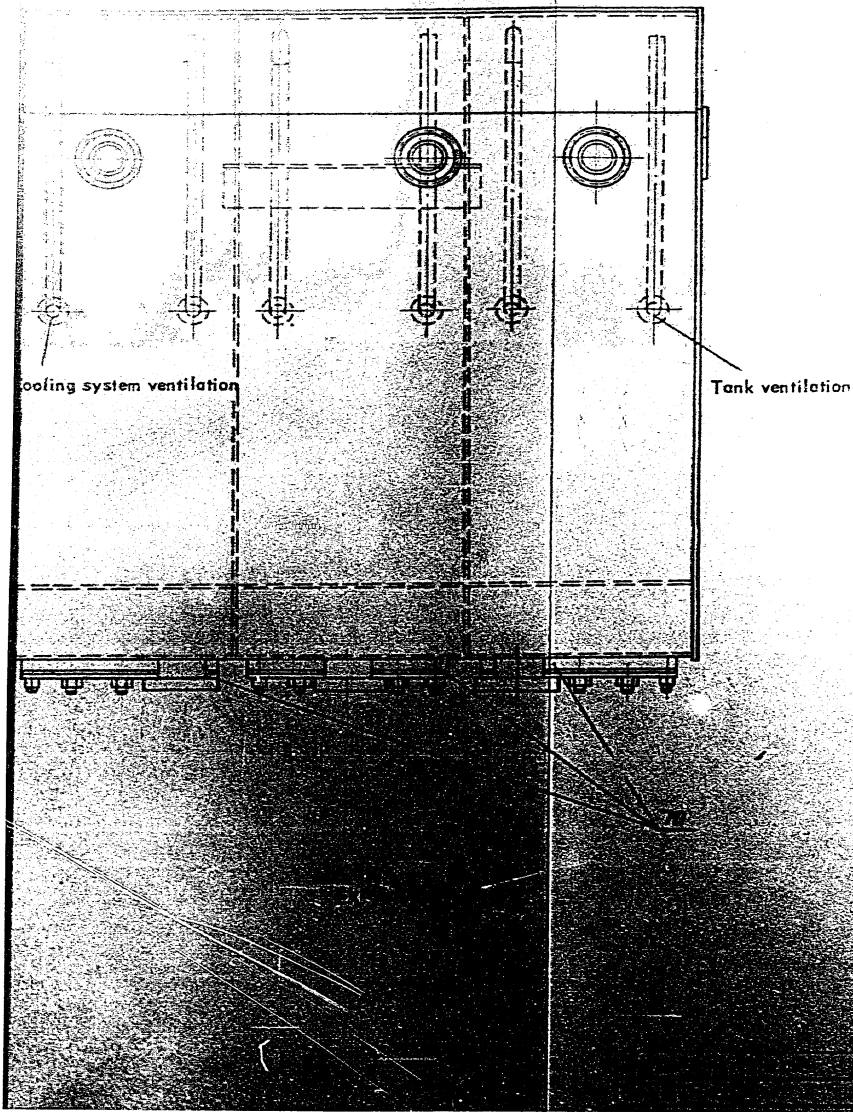
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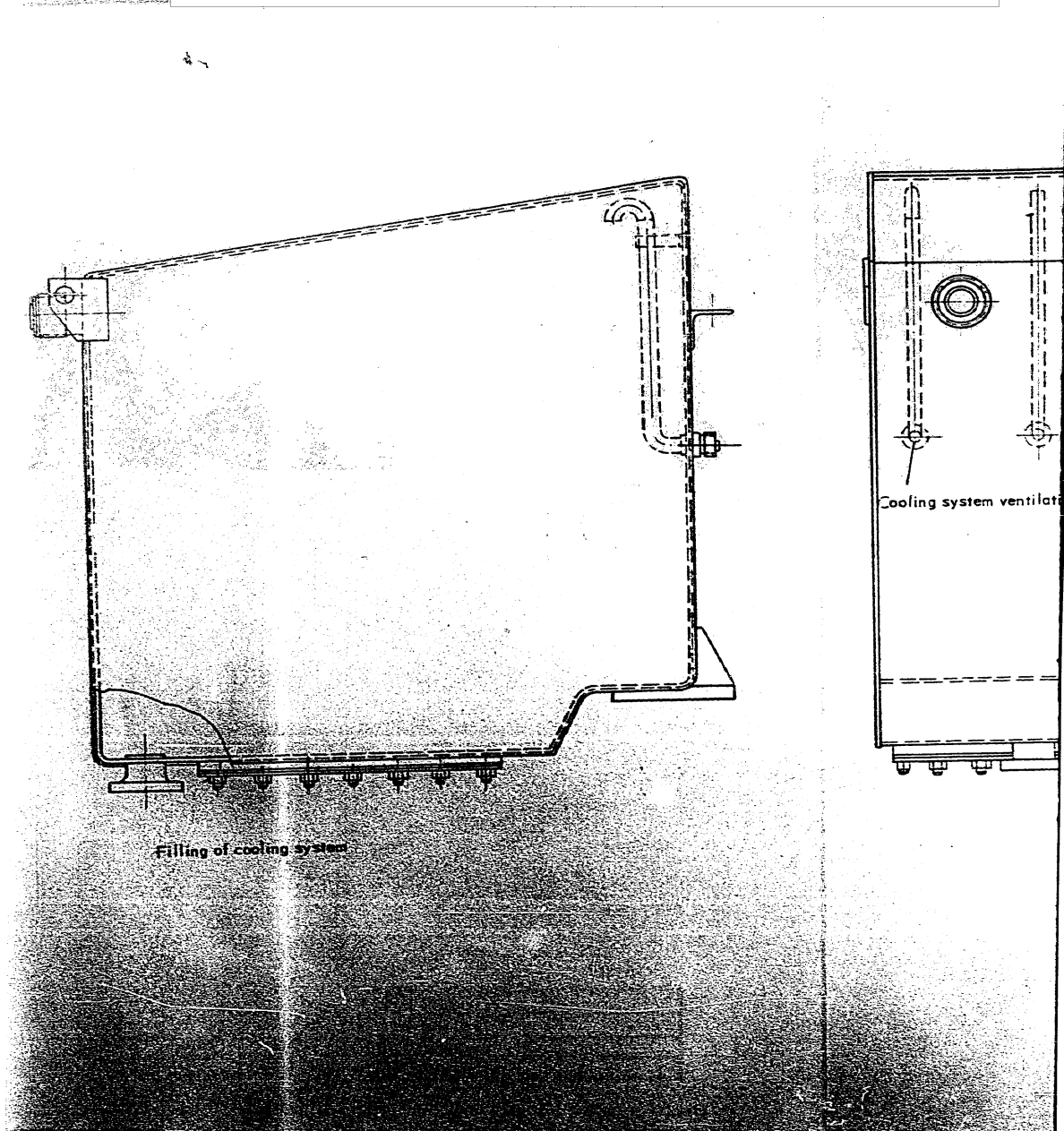


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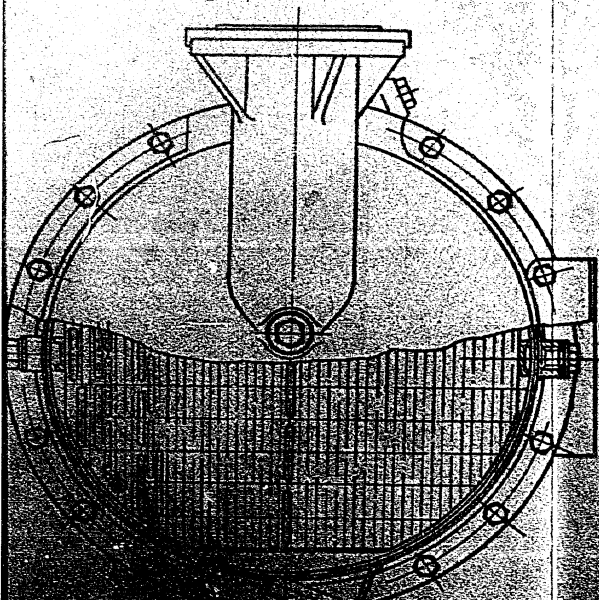
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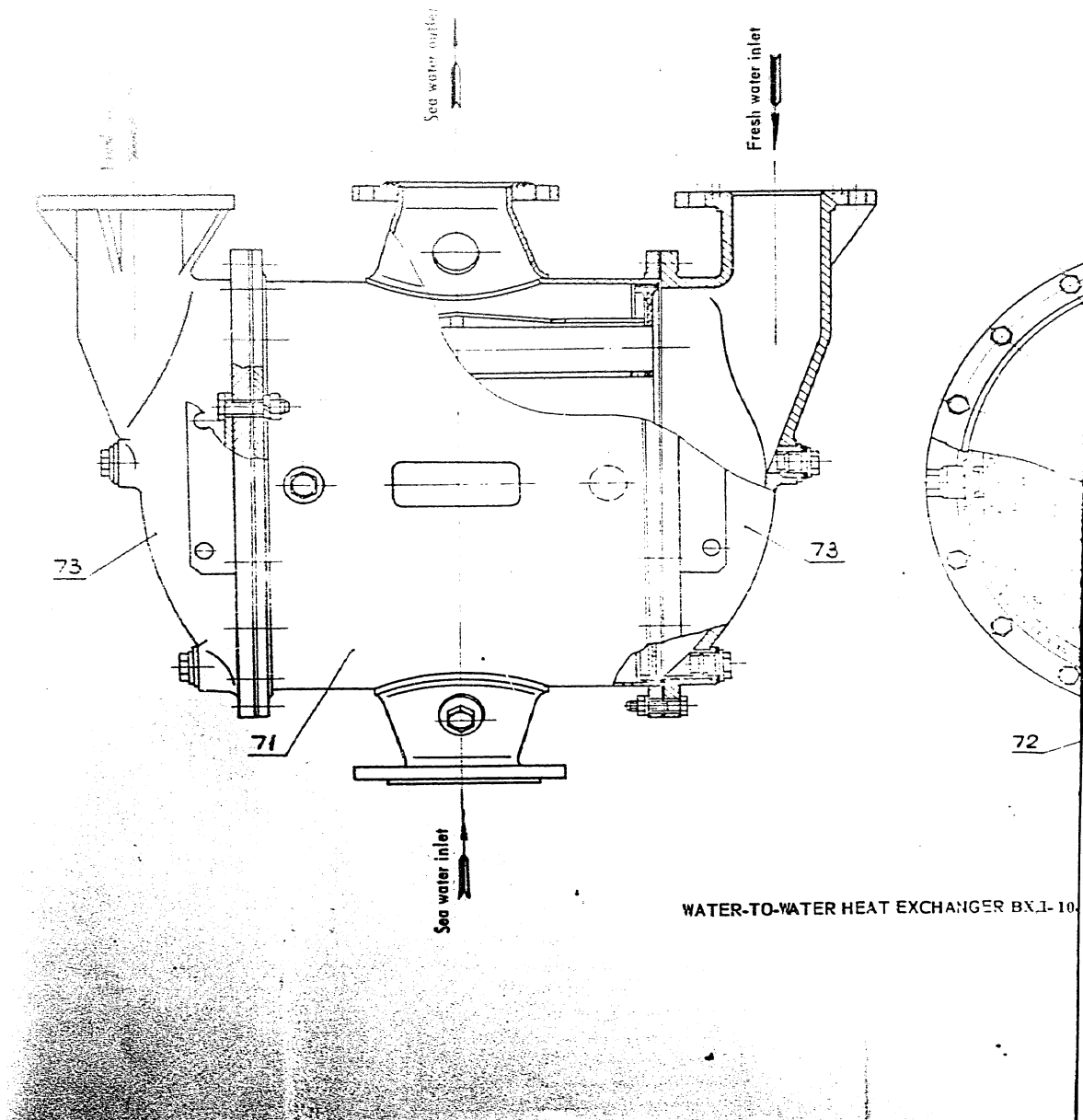


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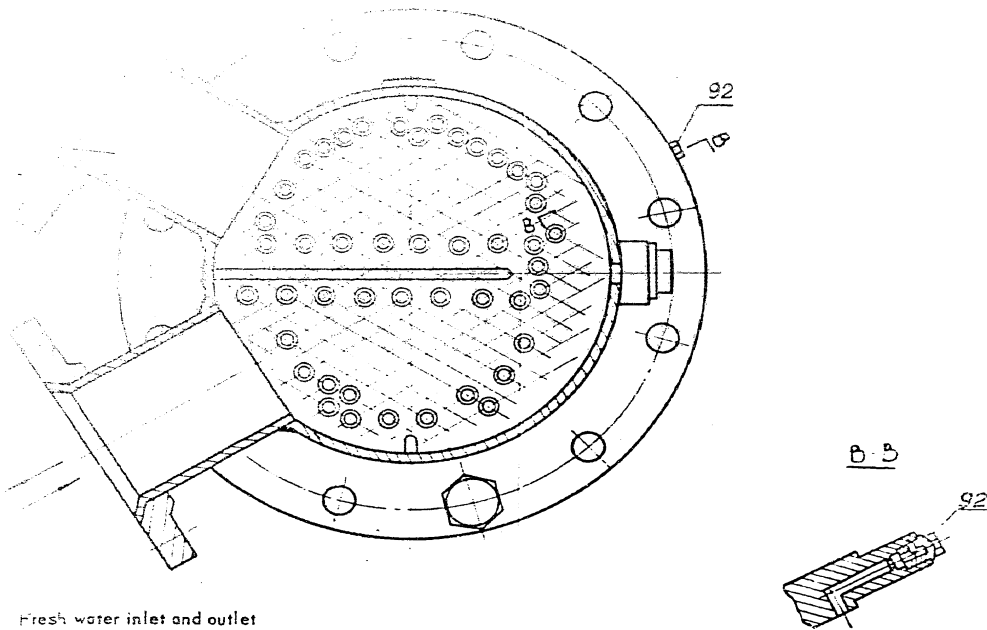


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SH WATER HEAT EXCHANGER ONB-1.2

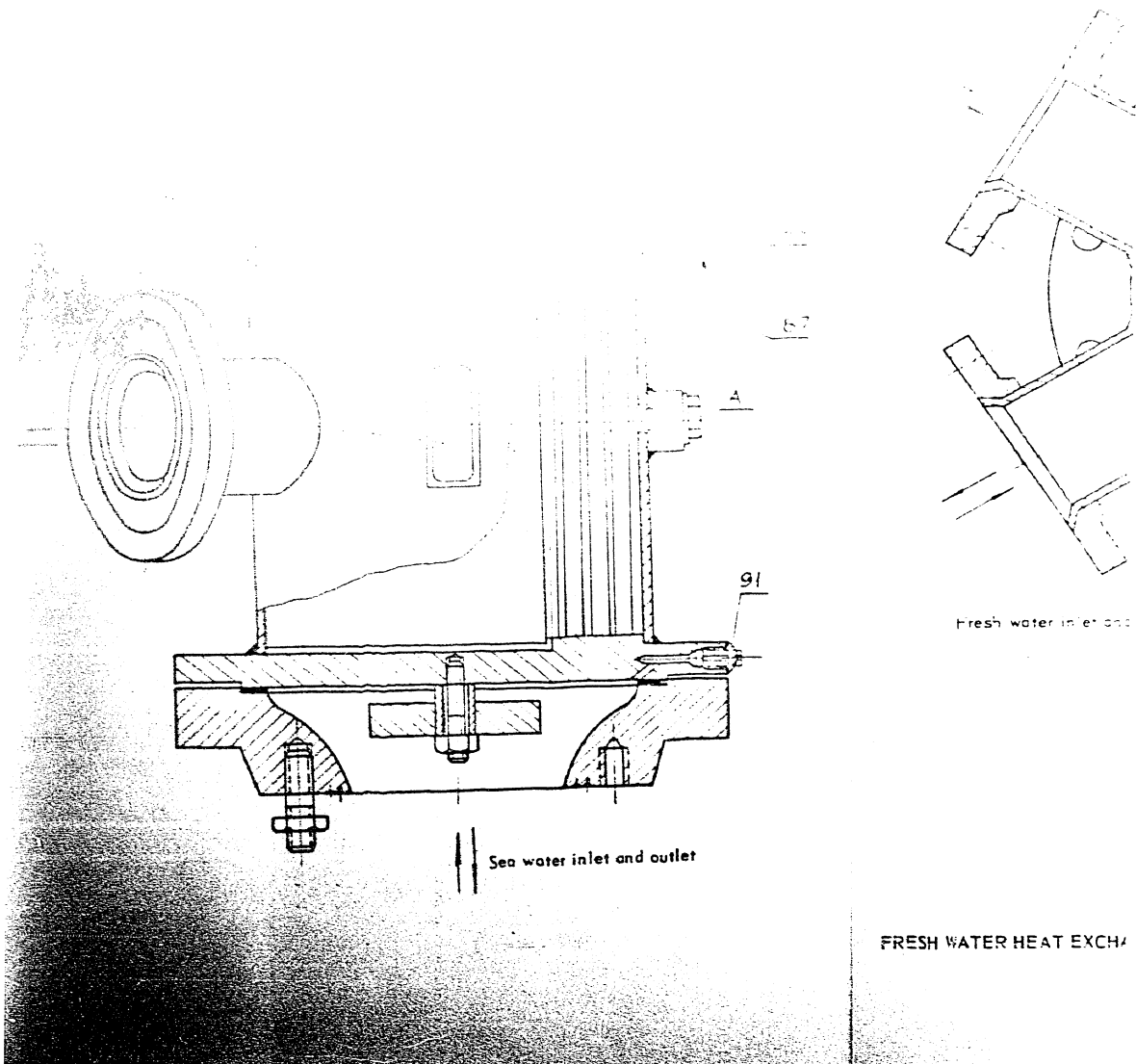
92	Plug
91	Plug
90	Protector
89	Cover
88	Reinforcing board
87	Flange
86	Description

SECRET

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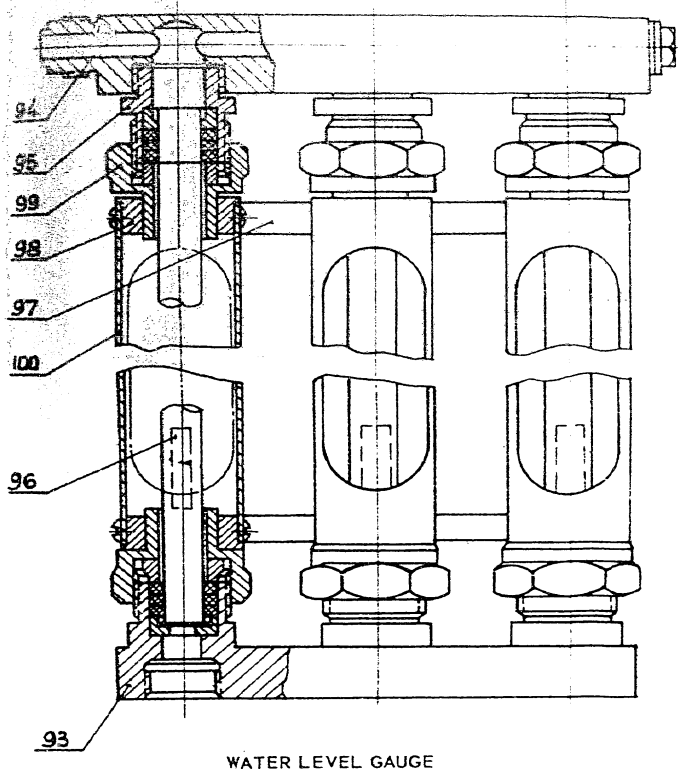
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Appendix No. 5



100	Cover
99	Union nut
98	Cover bushing
97	Plank
96	Float
95	Threaded union
94	Upper housing
93	Lower housing
Nos	Description

SECRET

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